

ICRU Report 95: *New Operational Quantities for External Exposure of the Eye Lens*

Thomas Otto, ICRU and CERN

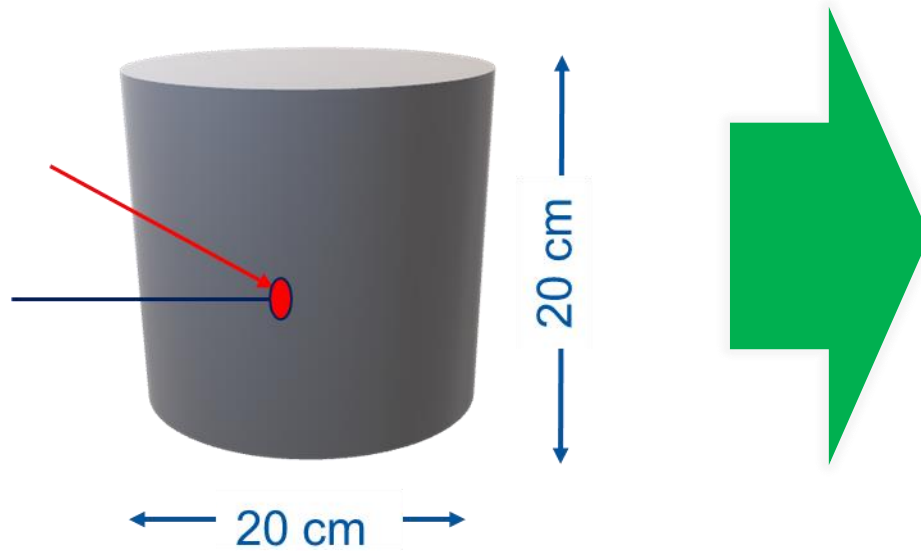
NEA EGDLE Webinar, 7. 3. 2022



Operational Quantity for the Eye Lens

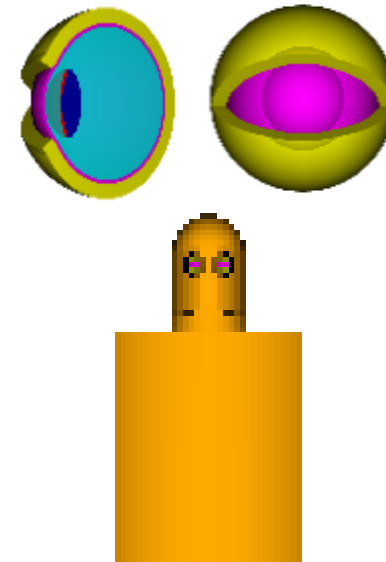
ICRU 39/51/57

- Personal dose equivalent $H_p(3)$
- $H_p(3) = D(3) * Q(L)$
- In 20 cm square cylinder
- Alternatively in slab

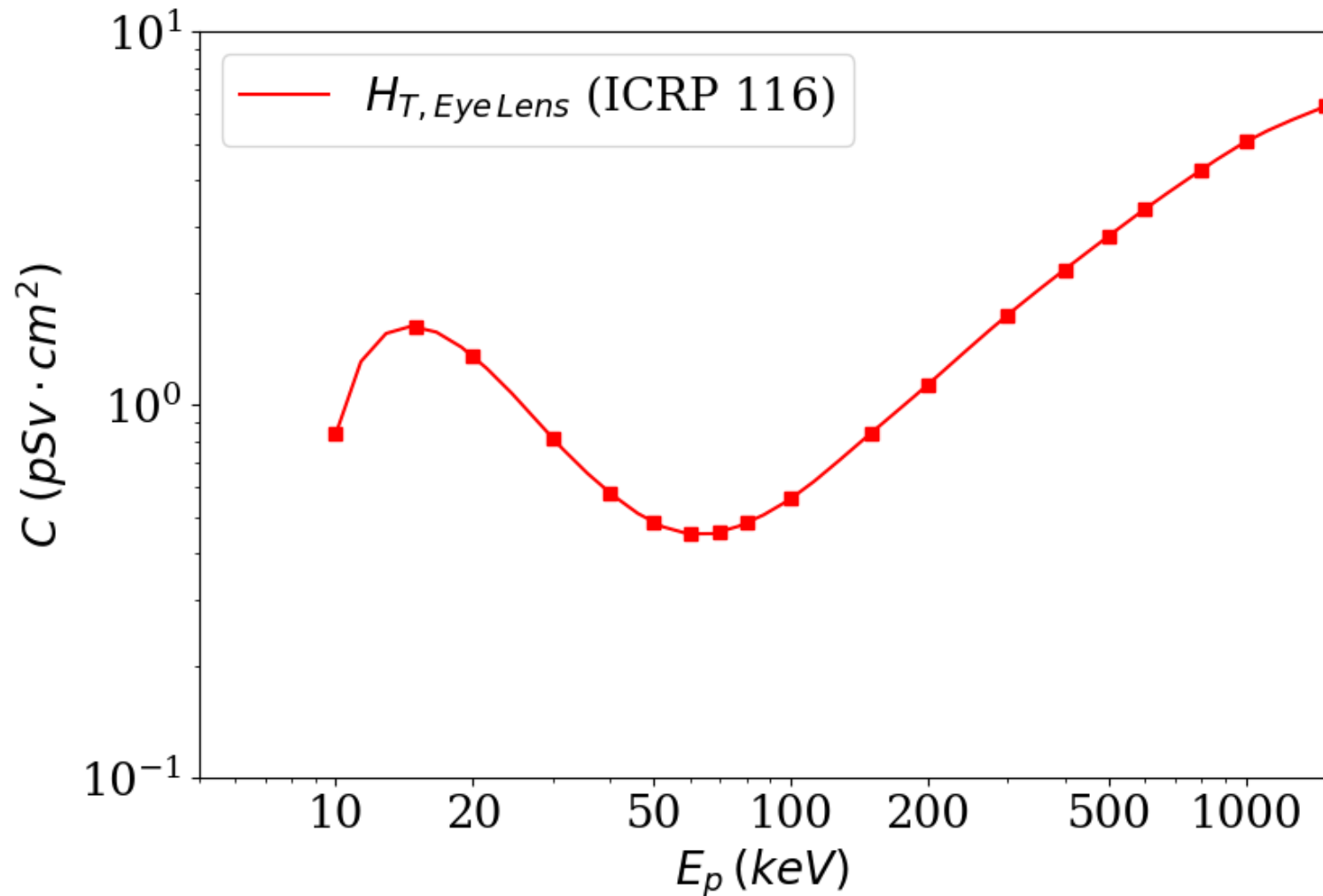


ICRU 95

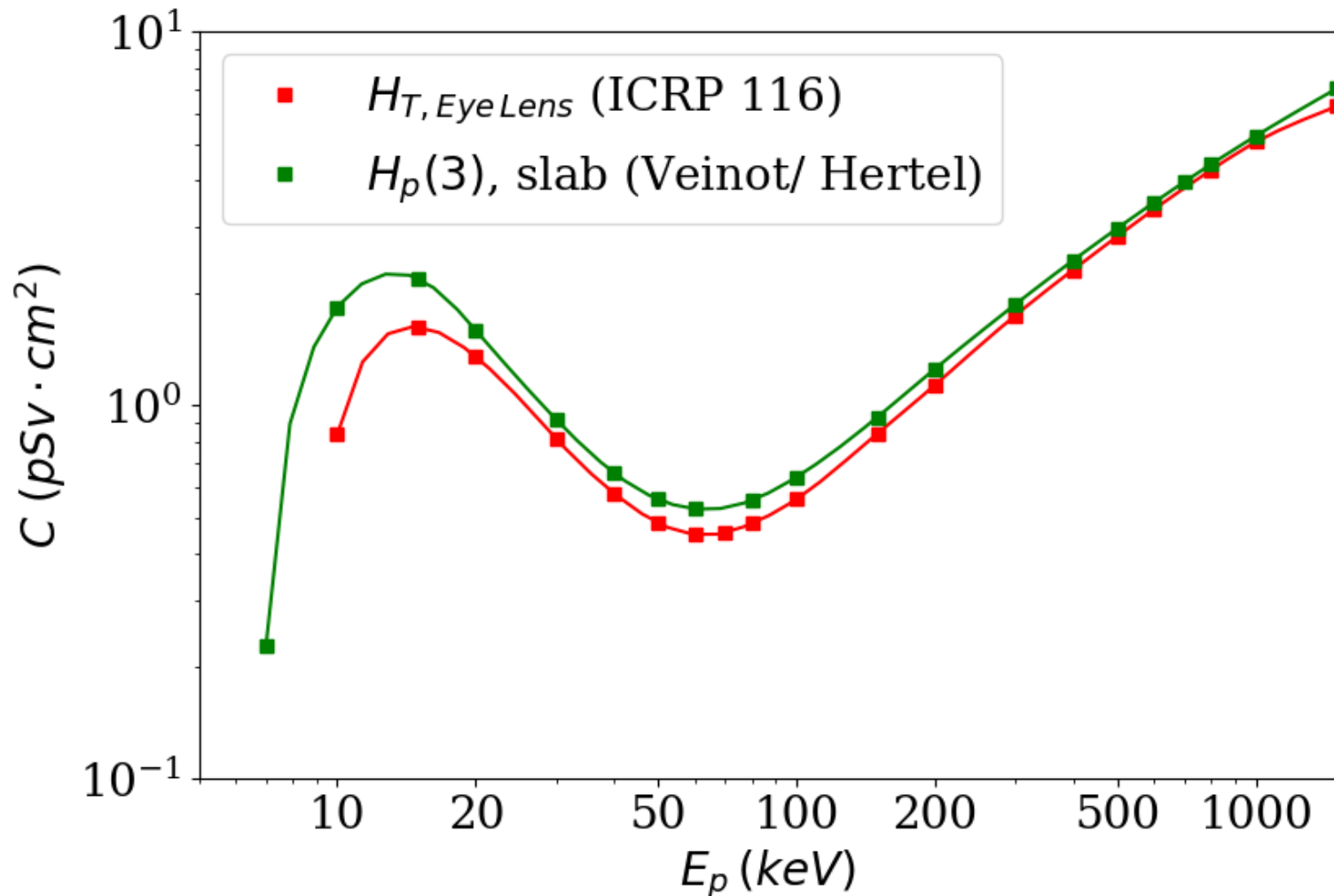
- Local absorbed dose to eye lens $D_{\text{eye lens}}$
- Absorbed dose in the eye lens (Behrens–Dietze model)
- Change for neutrons ($Q \neq 1$) !



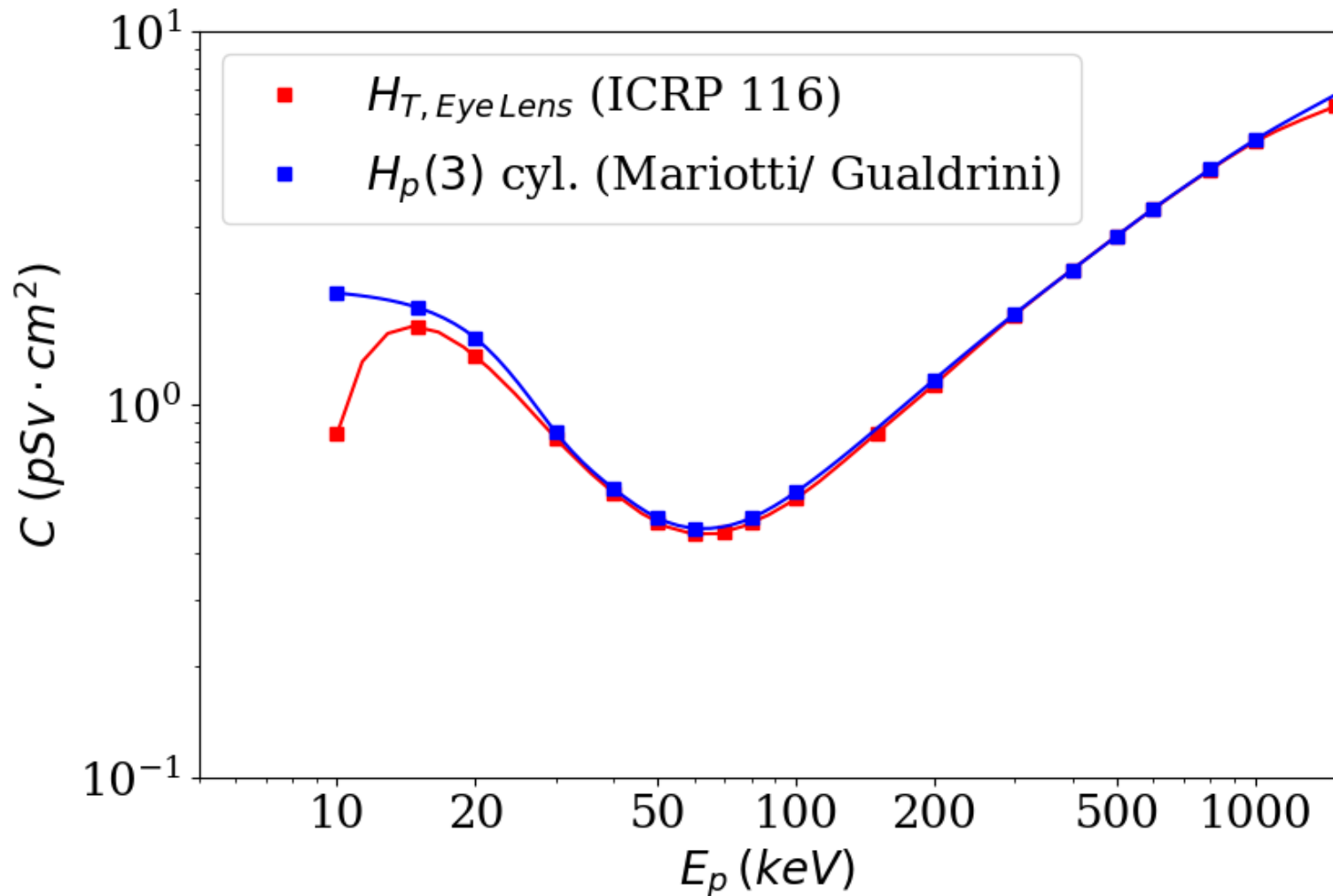
$H_{T, \text{eye lens}}$, $H_p(3)$ and $D_{\text{eye lens}}$ for Photons



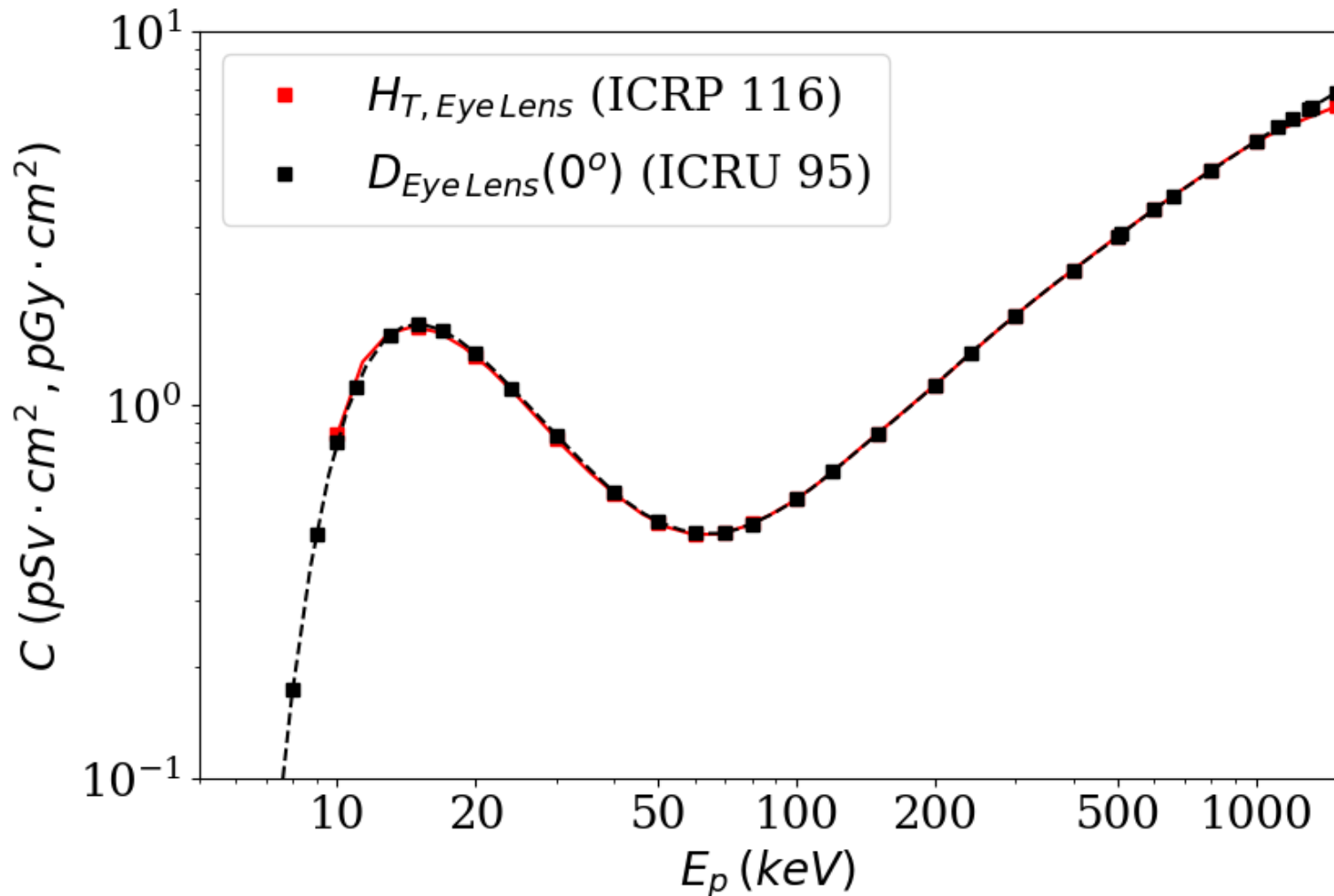
$H_{T, \text{eye lens}}$, $H_p(3)$ and $D_{\text{eye lens}}$ for Photons



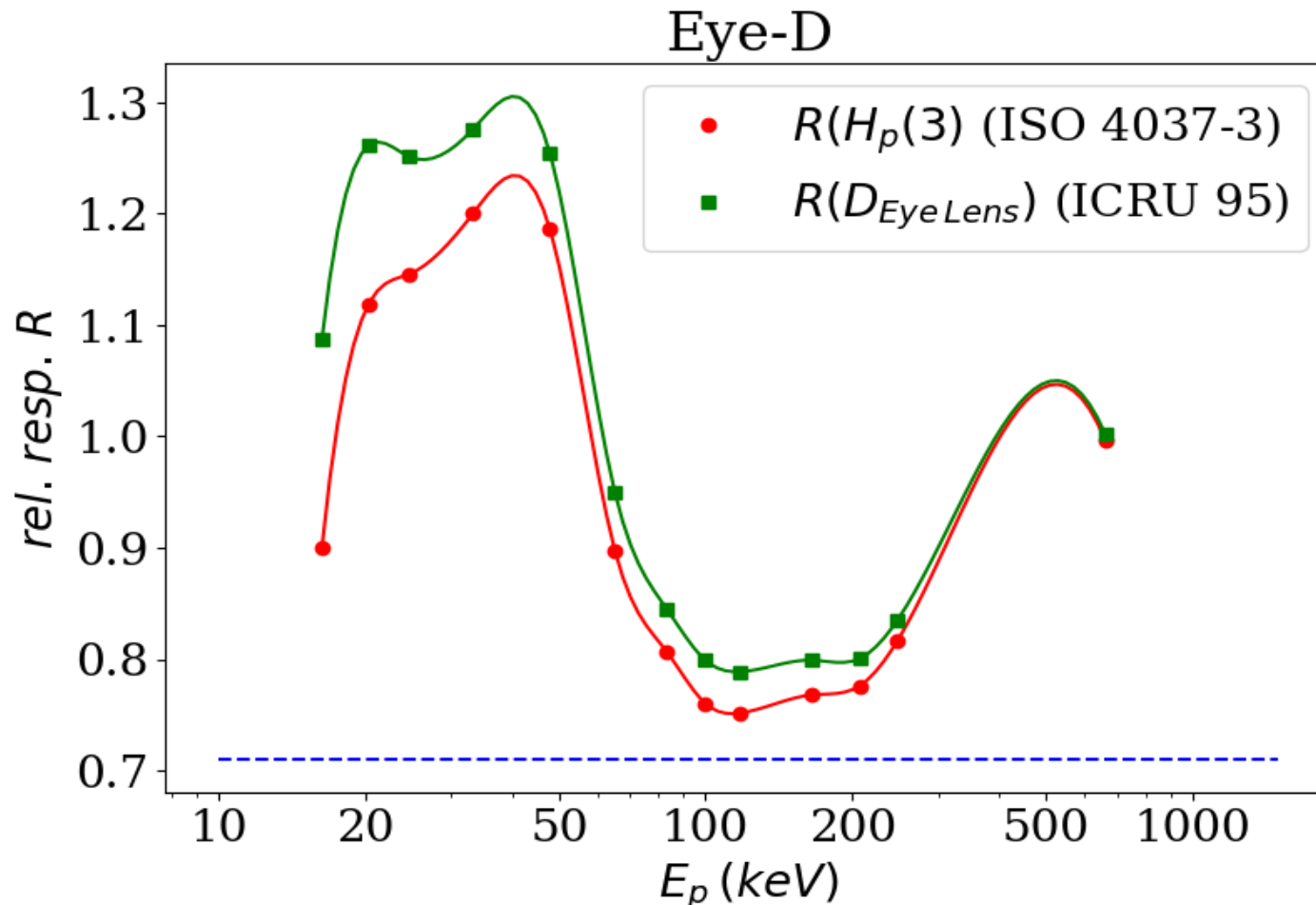
$H_{T, \text{eye lens}}$, $H_p(3)$ and $D_{\text{eye lens}}$ for Photons



$H_{T, \text{eye lens}}, H_p(3)$ and $D_{\text{eye lens}}$ for Photons



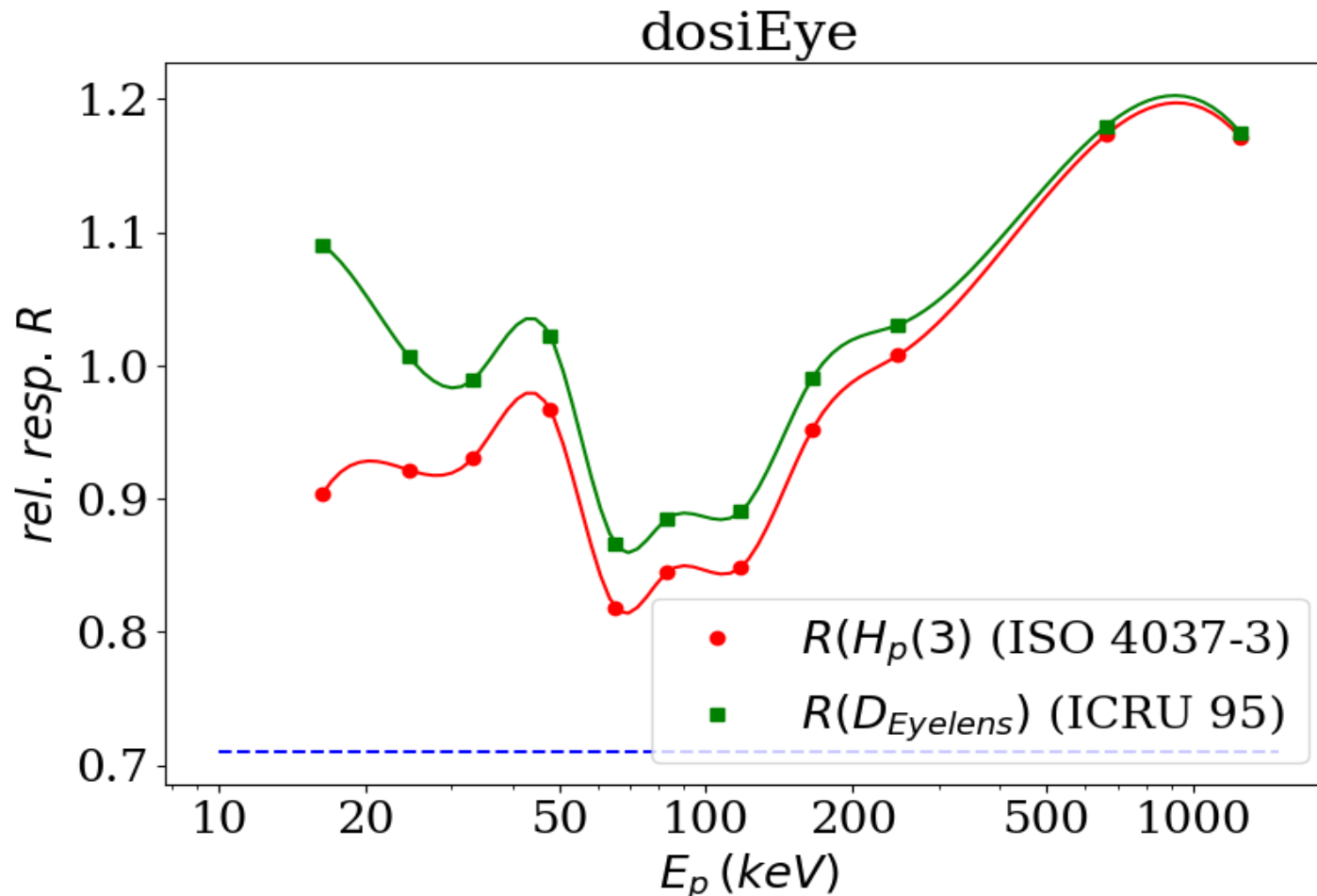
Response of Eye Lens Dosimeters



----- IEC acceptance levels

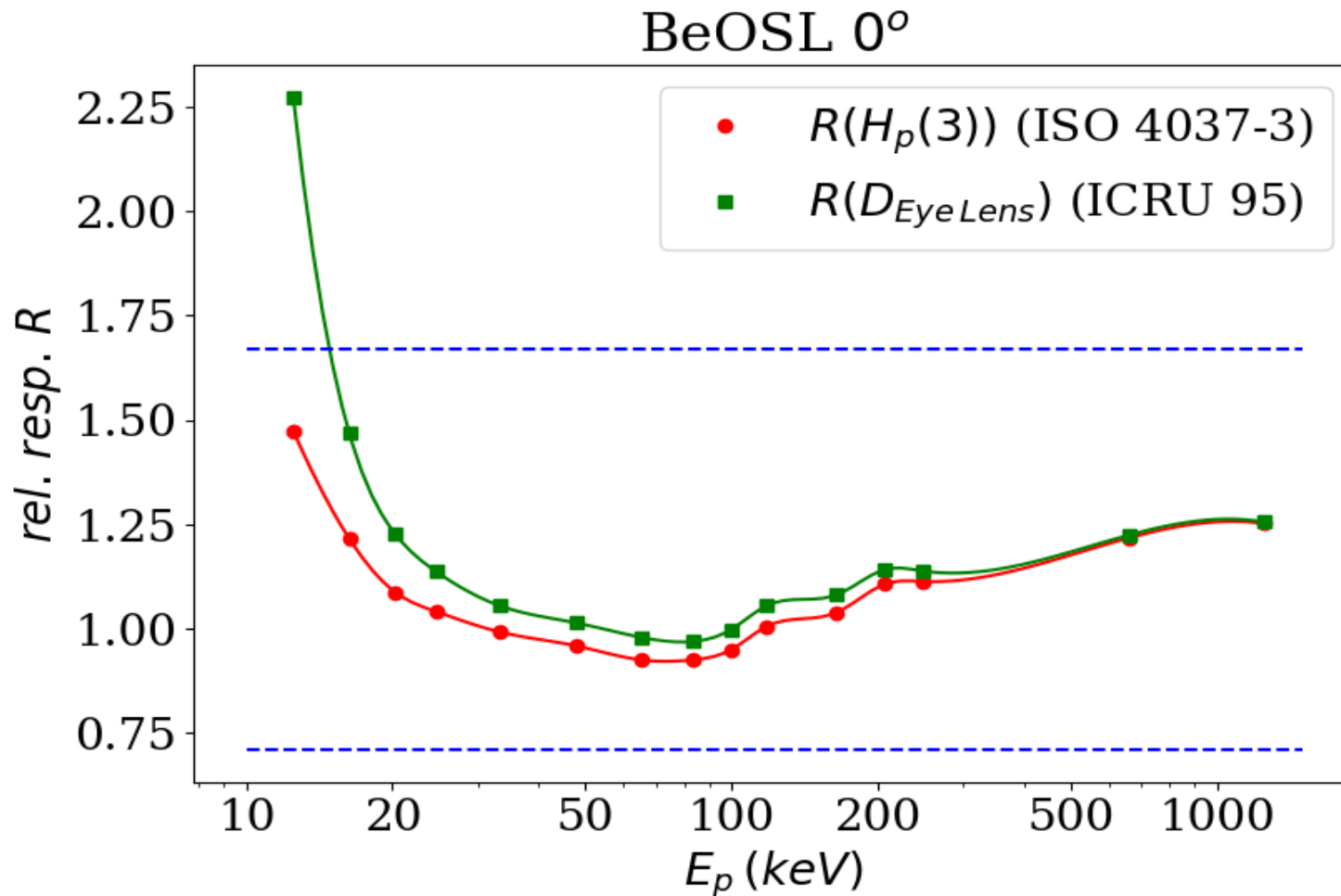


Response of Eye Lens Dosimeters



----- IEC acceptance levels

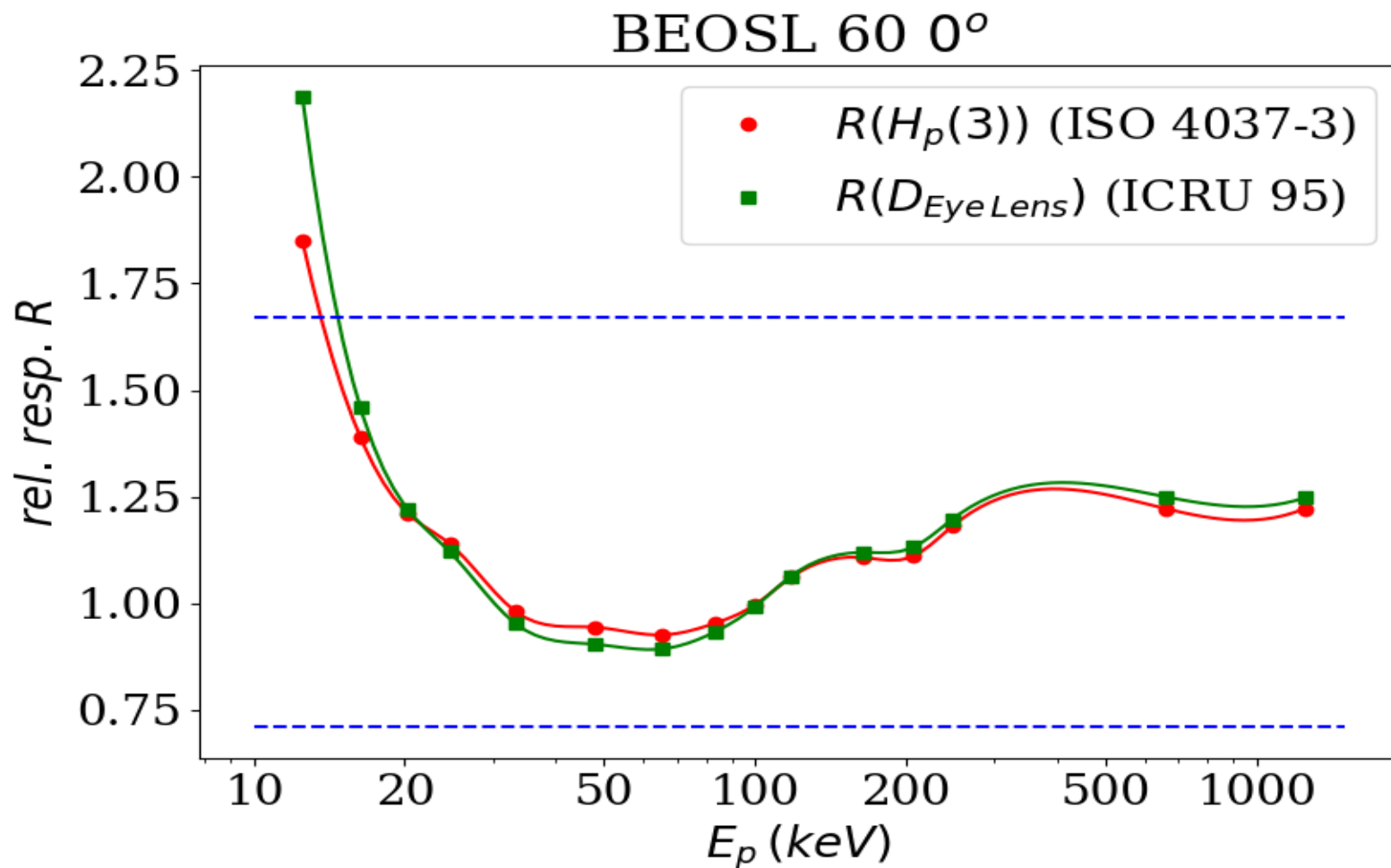
Response of Eye Lens Dosimeters



----- IEC acceptance levels



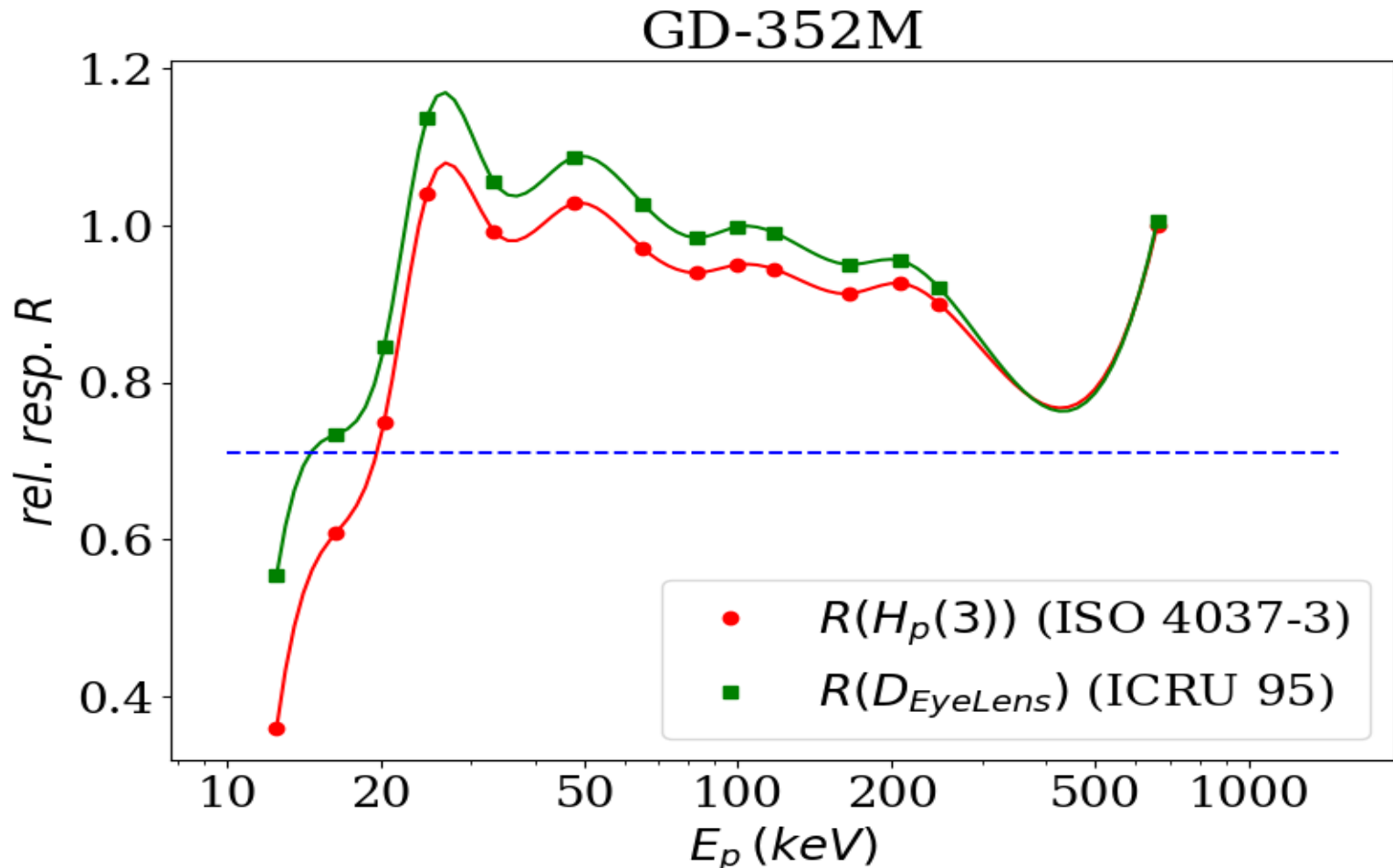
Response of Eye Lens Dosimeters



----- IEC acceptance levels

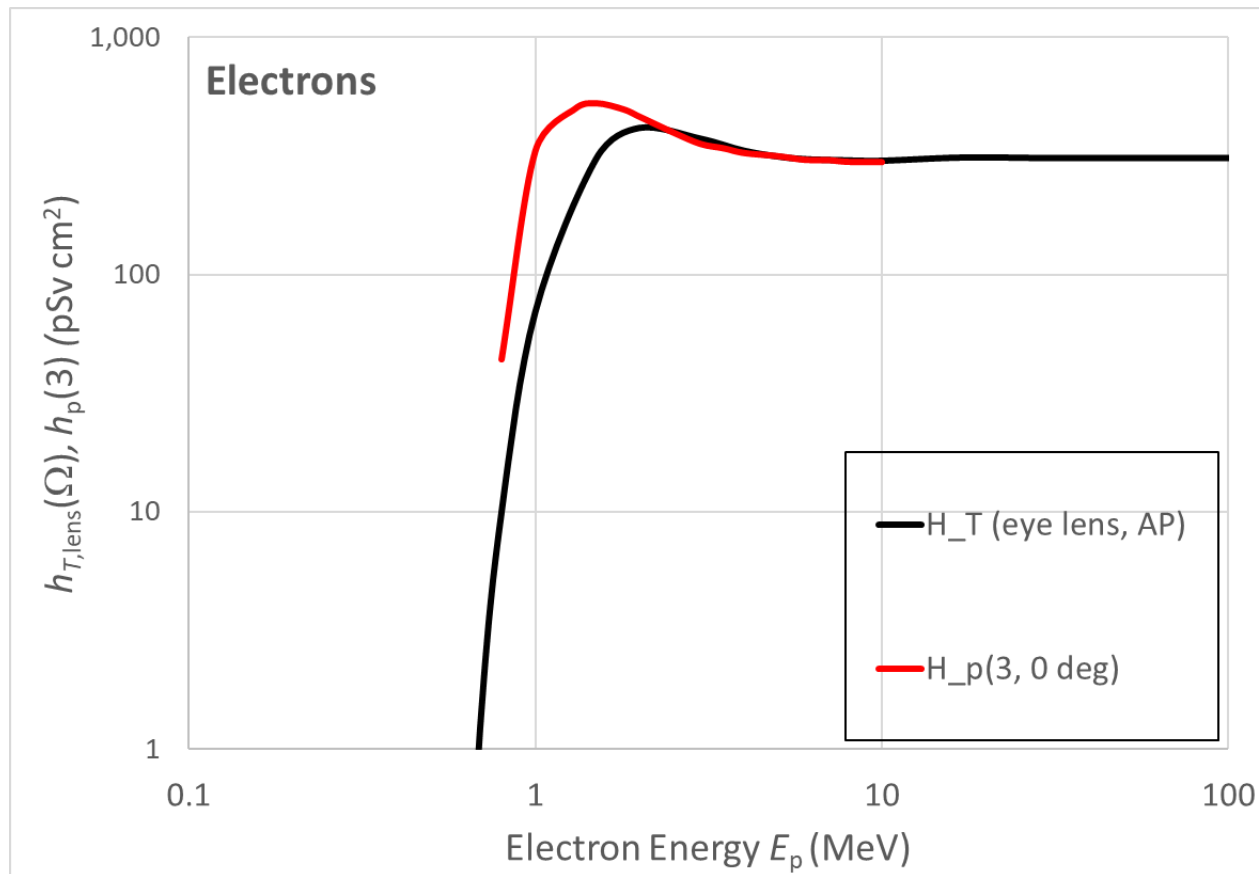


Response of Eye Lens Dosimeters



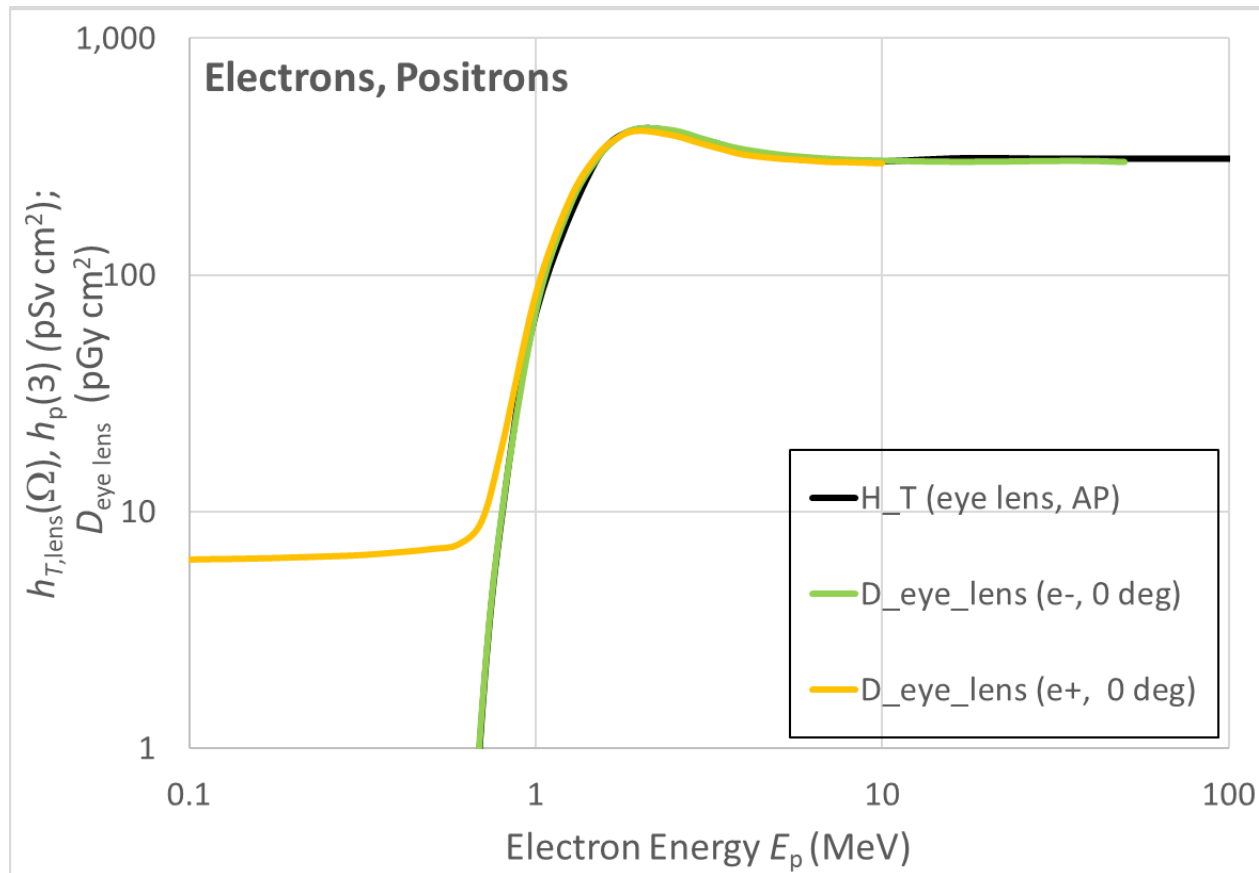
----- IEC acceptance levels

$H_{T, \text{eye lens}}, H_p(3)$ and $D_{\text{eye lens}}$ for Electrons



$H_p(3)$ overestimates H_T in the energy range of energetic β - emitters

$H_{T, \text{eye lens}}, H_p(3)$ and $D_{\text{eye lens}}$ for Electrons



$D_{\text{eye lens}}$ has conversion coefficients for electrons **and** positrons



Conclusion

- The energy dependence of the conversion coefficients of $H_p(3)$ and $D_{\text{eye Lens}}$ for photons is similar, with exception at low $E < 30$ keV
- The response of available eye lens dosimeters for photons is acceptable within the acceptance levels of IEC
- For electrons, overestimation of $H_{T,\text{lens}}$ and D_{eyeLens} by $H_p(3)$ for $E < 3$ MeV
- There are few data on β -response of eye lens dosimeters





Thank you for your Attention